

REMARKS

This Response is submitted in reply to the Office Action dated April 14, 2009. Claims 1 to 22 are pending in the present application. Claims 1 to 22 are hereby amended. No new matter has been added by such amendments. Claims 1, 7, 13 and 18 are in independent form. A Petition for a Two Month Extension of Time to reply to the Office Action is submitted with this Response. Please charge Deposit Account No. 02-1818 for all payments due in connection with this Response.

The Office Action objected to Figure 6 and stated that such figure should be designated by a legend such as "Prior Art". Applicant has amended Figure 6 to include the "Prior Art" legend and submits that this amendment overcomes this objection.

The Office Action rejected Claims 1, 2, 4, 7, 8 and 10 under 35 U.S.C. § 102(b) as being anticipated by McGillem, et al. "A Chaotic Direct-Sequence Spread-Spectrum Communication System", IEEE Transactions on Communications, Vol. 42, Issue: 234, Pages 1524-1527, April 1994 ("McGillem"). Applicant respectfully disagrees with these rejections.

McGillem discloses a chaotic direct-sequence spread-spectrum communication system. The Abstract of McGillem discloses:

The user of chaotic sequences as spectral spreading sequences in direct-sequence spread-spectrum (DS/SS) communications is proposed. The error probabilities of such systems are investigated and shown to be, for all practical purposes, identical to the conventional DS/SS systems which use binary signature sequences. Among the advantages of the use of chaotic sequences in DS/SS are the availability of a great number of them, the ease of their generation, as well as their inherent improvement to the security of transmission.

More specifically, Page 1525, left-column, lines 7-18 of McGillem discloses:

One major difference between chaotic sequences and the above described PN sequences is that chaotic sequences are not binary. Their correlation properties, however, can be shown to be very similar to those of the random binary sequences. This has been done analytically for the case of chaotic logistic sequences [8]. The auto-correlation is identically zero. Furthermore, the estimates of the auto-correlation and the cross-correlation function approach correct values as the number of points of the sequences considered in the estimation, N , increases. The standard deviation of the points in the estimate function decreased as $1/N$.

Page 3 of the Office Action stated that McGillem discloses:

wherein a first chaos spreading code which is inputted to said first spreading unit and a second chaos spreading code which is inputted to said second spreading unit orthogonally cross each other, that is, an absolute value of a normalized correlation coefficient of said first and second chaos spreading codes is equal to or less than 0.3 (Page 1525, left-column, lines 9-18) {Interpretation: The reference discloses the cross correlation is identically zero}.

In view thereof, it appears that the Office Action interprets the auto-correlation of the chaotic sequences of McGillem as the absolute value of a normalized correlation coefficient of the first and second spreading codes of the communicating apparatus of amended independent Claim 1. Applicant respectfully disagrees with this interpretation and submits that an auto-correlation of chaotic sequences is fundamentally different from an absolute value of a normalized coefficient of spreading codes. Accordingly, Applicant submits that the disclosure of McGillem that the Office Action relies upon (i.e., Page 1525, left-column, lines 9-18) does not disclose a transmitting unit to which output signals of said first and second spreading units are inputted, wherein a first chaos spreading code which is inputted to said first spreading unit and a second chaos spreading code which is inputted to said second spreading unit orthogonally cross each other, wherein an absolute value of a normalized correlation coefficient of said first and second chaos spreading codes is equal to or less than 0.3. Additionally, it would not have been obvious to one of ordinary skill in the art to modify McGillem to result in such a communicating apparatus without reasonably being construed as improper hindsight reconstruction. On the other hand, the communicating apparatus of amended independent Claim 1 includes, among other elements, "a transmitting unit to which output signals of said first and second spreading units are inputted, wherein a first chaos spreading code which is inputted to said first spreading unit and a second chaos spreading code which is inputted to said second spreading unit orthogonally cross each other, wherein an absolute value of a normalized correlation coefficient of said first and second chaos spreading codes is equal to or less than 0.3."

Because the first chaos spreading code and the second chaos spreading code orthogonally cross each other and the absolute value of the normalized coefficient of the first and second chaos spreading codes is equal to or less than 0.3, multipliers for orthogonal modulation can be made unnecessary and the construction for modulation and demodulation can be simplified.

For at least these reasons, it is respectfully submitted that independent Claim 1 is patentably distinguished over McGillem and in condition for allowance. Dependent Claims 2 and 4 depend directly from amended independent Claim 1 and are also allowable for the reasons given with respect to Claim 1 and because of the additional features recited in these claims.

Independent Claim 7 includes certain similar elements to independent Claim 1. For reasons similar to those discussed above with respect to independent Claim 1, independent Claim 7 (and dependent Claims 8 and 10) are each patentably distinguished over McGillem and in condition for allowance.

The Office Action rejected Claims 3, 15, 9 and 20 under 35 U.S.C. § 103(a) as being unpatentable over McGillem in view of U.S. Patent Application Publication No. 2005/0033785 to Umeno et al. ("Umeno"). Applicant respectfully disagrees with these rejections.

Umeno discloses a random number string output apparatus and method. The Abstract of Umeno discloses:

A random number sequence output apparatus (101) includes a sequence acceptance unit (102) for accepting input of a numerical sequence, an initial value setting unit (103) for accepting an initial value and causing a storage unit (104) to store this, an output unit (105) for outputting a new value stored in the storage unit (104), a calculation unit (106) for applying a predetermined rational map stored in the storage unit (104) each time the output unit (105) outputs a value and further applying a predetermined calculation unit to the value and value extracted from the numerical sequence accepted by the sequence acceptance unit (102), and an updating unit (104) to store the value of the result of calculation performed by the calculation unit (106), thereby performing updating.

Page 5 of the Office Action stated:

it would have been obvious to one of ordinary skill in the art at the time of the invention that Umeno teaches storing the initial value in a storing unit; and executing chaos mapping based on a Chebyshev polynomial; and randomizing means for randomizing a least significant bit of an output of said mapping unit; and a path for outputting the output of said mapping unit including said randomized least significant bit, as said chaos spreading code, and returning said output to said storing unit and this is implemented in the apparatus as described in McGillem so as to be able to generate a chaos spreading code so as to obtain a truly random spreading code.

Applicant respectfully disagrees and submits that, even if properly combined, neither McGillem or Umeno individually, nor the communicating apparatus resulting from a

combination of McGillem and Umeno disclose a transmitting unit to which output signals of said first and second spreading units are inputted, wherein a first chaos spreading code which is inputted to said first spreading unit and a second chaos spreading code which is inputted to said second spreading unit orthogonally cross each other, wherein an absolute value of a normalized correlation coefficient of said first and second chaos spreading codes is equal to or less than 0.3. Additionally, it would not have been obvious to one of ordinary skill in the art to modify McGillem and Umeno to result in such a communicating apparatus without reasonably being construed as improper hindsight reconstruction. On the other hand, the communicating apparatus of Claim 3 includes, among other elements, "a transmitting unit to which output signals of said first and second spreading units are inputted, wherein a first chaos spreading code which is inputted to said first spreading unit and a second chaos spreading code which is inputted to said second spreading unit orthogonally cross each other, wherein an absolute value of a normalized correlation coefficient of said first and second chaos spreading codes is equal to or less than 0.3."

For at least these reasons, it is respectfully submitted that Claim 3 is patentably distinguished over McGillem and Umeno and in condition for allowance. Claims 9, 15 and 20 each include certain similar elements to Claim 3. For reasons similar to those discussed above with respect to independent Claim 3, Claims 9, 15 and 20 are each patentably distinguished over McGillem and Umeno and in condition for allowance.

The Office Action rejected Claims 5, 6, 11 to 13, 14, 16 to 19, 21 and 22 are rejected under 35 U.S.C. § 103(a) as being unpatentable over McGillem. Applicant respectfully disagrees with these rejections.

Page 7 of the Office Action stated:

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention that McGillem satisfies the limitation of the claims.

Applicant respectfully disagrees and submits that McGillem does not disclose a transmitting unit to which output signals of said first and second spreading units are inputted, wherein a first chaos spreading code which is inputted to said first spreading unit and a second chaos spreading code which is inputted to said second spreading unit orthogonally cross each other, wherein an absolute value of a normalized correlation coefficient of said first and second

chaos spreading codes is equal to or less than 0.3. Additionally, it would not have been obvious to one of ordinary skill in the art to modify McGillem to result in such a communicating apparatus without reasonably being construed as improper hindsight reconstruction. On the other hand, the communicating apparatus of Claim 5 includes, among other elements, "a transmitting unit to which output signals of said first and second spreading units are inputted, wherein a first chaos spreading code which is inputted to said first spreading unit and a second chaos spreading code which is inputted to said second spreading unit orthogonally cross each other, wherein an absolute value of a normalized correlation coefficient of said first and second chaos spreading codes is equal to or less than 0.3."


For at least these reasons, it is respectfully submitted that Claim 5 is patentably distinguished over McGillem and in condition for allowance. Claims 6, 11 to 13, 14, 16 to 19, 21 and 22 each include certain similar elements to Claim 5. For reasons similar to those discussed above with respect to Claim 5, Claims 6, 11 to 13, 14, 16 to 19, 21 and 22 are each patentably distinguished over McGillem and in condition for allowance.

An earnest endeavor has been made to place this application in condition for formal allowance, and allowance is courteously solicited. If the Examiner has any questions regarding this Response, Applicant respectfully requests that the Examiner contact the undersigned.

Respectfully submitted,

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